UMBC

Remote sensing (PHYS 722) Homework 03

Submitted by

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QUESTION 1 & 2

The region of the globe I selected is bounded by 17°19'56.6"N 119°15'54.4"W (The Pacific ocean) and 34°51'19.4"N 99°49'49.8"W (Vinson, Oklahoma, USA) for Day 40 (9th February, 2021) at 17:25 using the Aqua Modis.

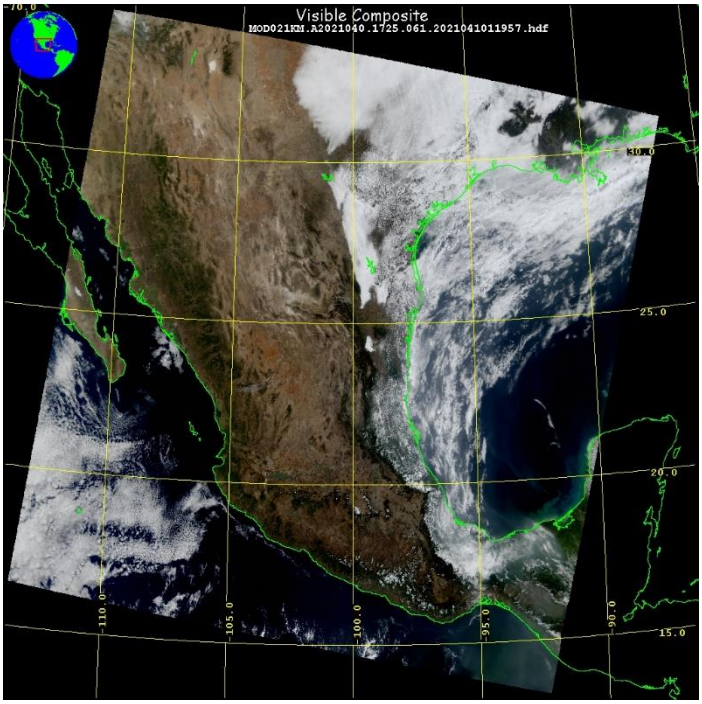


Figure1: Earth data image of the selected location showing land, ocean, cloud, and vegetation

Figure2: Google map image of the selected coordinates showing Vinson, Oklahoma, the North Pacific Ocean, Gulf of Mexico, and surrounding regions.

QUESTION 3

The downloaded file is MOD021KM.A2021040.1725.061.2021041011957.hdf. Its list of scientific dataset as revealed obtained using a python code are 31 components listed below:

```
1 Latitude
2 Longitude
3 EV_1KM_RefSB
4 EV_1KM_RefSB_Uncert_Indexes
5 EV_1KM_Emissive
6 EV_1KM_Emissive_Uncert_Indexes
7 EV_250_Aggr1km_RefSB
8 EV_250_Aggr1km_RefSB_Uncert_Indexes
9 EV_250_Aggr1km_RefSB_Samples_Used
10 EV_500_Aggr1km_RefSB
11 EV_500_Aggr1km_RefSB_Uncert_Indexes
12 EV_500_Aggr1km_RefSB_Samples_Used
13 Height
14 SensorZenith
15 SensorAzimuth
16 Range
17 SolarZenith
18 SolarAzimuth
19 gflags
20 EV_Band26
21 EV_Band26_Uncert_Indexes
22 Band_250M
23 Band_500M
24 Band_1KM_RefSB
25 Band_1KM_Emissive
26 Noise in Thermal Detectors
27 Change in relative responses of thermal detectors
28 DC Restore Change for Thermal Bands
29 DC Restore Change for Reflective 250m Bands
30 DC Restore Change for Reflective 500m Bands
31 DC Restore Change for Reflective 1km Bands
```

The RGB plot and NDVI plot in question four required only two datasets, which are the **`EV_250_Aggr1km_RefSB`** and **`EV_500_Aggr1km_RefSB`**. The important attributes necessary in the plots are the scale factor and offsets. The full attributes are displayed below.

EV 250 Aggr1km RefSB


```
{'_FillValue': 65535,
 'band_names': '1,2',
 'corrected_counts_offsets': [-0.0, -0.0],
 'corrected_counts_scales': [0.12497329711914062, 0.12497329711914062],
 'corrected_counts_units': 'counts',
 'long_name': 'Earth View 250M Aggregated 1km Reflective Solar Bands Scale
d '
              'Integers',
 'radiance_offsets': [-0.0, -0.0],
 'radiance_scales': [0.029676072299480438, 0.011032006703317165],
 'radiance_units': 'Watts/m^2/micrometer/steradian',
 'reflectance_offsets': [-0.0, -0.0],
 'reflectance_scales': [5.651243554893881e-05, 3.4008109651040286e-05],
 'reflectance_units': 'none',
 'units': 'none',
 'valid_range': [0, 32767]}
```


EV 500 Aggr1km RefSB


```
{'_FillValue': 65535,
 'band_names': '3,4,5,6,7',
 'corrected_counts_offsets': [-0.0, -0.0, -0.0, -0.0, -0.0],
 'corrected_counts_scales': [0.12497329711914062,
                             0.12497329711914062,
                             0.12497329711914062,
                             0.12497329711914062,
                             0.12497329711914062],
 'corrected_counts_units': 'counts',
 'long_name': 'Earth View 500M Aggregated 1km Reflective Solar Bands Scale
d '
              'Integers',
 'radiance_offsets': [-0.0, -0.0, -0.0, -0.0, -0.0],
 'radiance_scales': [0.040888816118240356,
                     0.032728686928749084,
                     0.006037474609911442,
                     0.0027420350816100836,
                     0.0009224729728884995],
 'radiance_units': 'Watts/m^2/micrometer/steradian',
 'reflectance_offsets': [-0.0, -0.0, -0.0, -0.0, -0.0],
 'reflectance_scales': [5.9898469771724194e-05,
                        5.364884054870345e-05,
                        3.893058601533994e-05,
                        3.4912023693323135e-05,
                        3.123738133581355e-05],
 'reflectance_units': 'none',
 'units': 'none',
 'valid_range': [0, 32767]}
```

QUESTION 4

The whitish region represents the cloudy region, the dark region represents cloud free ocean, and the dark-greenish region is indicative of vegetation.

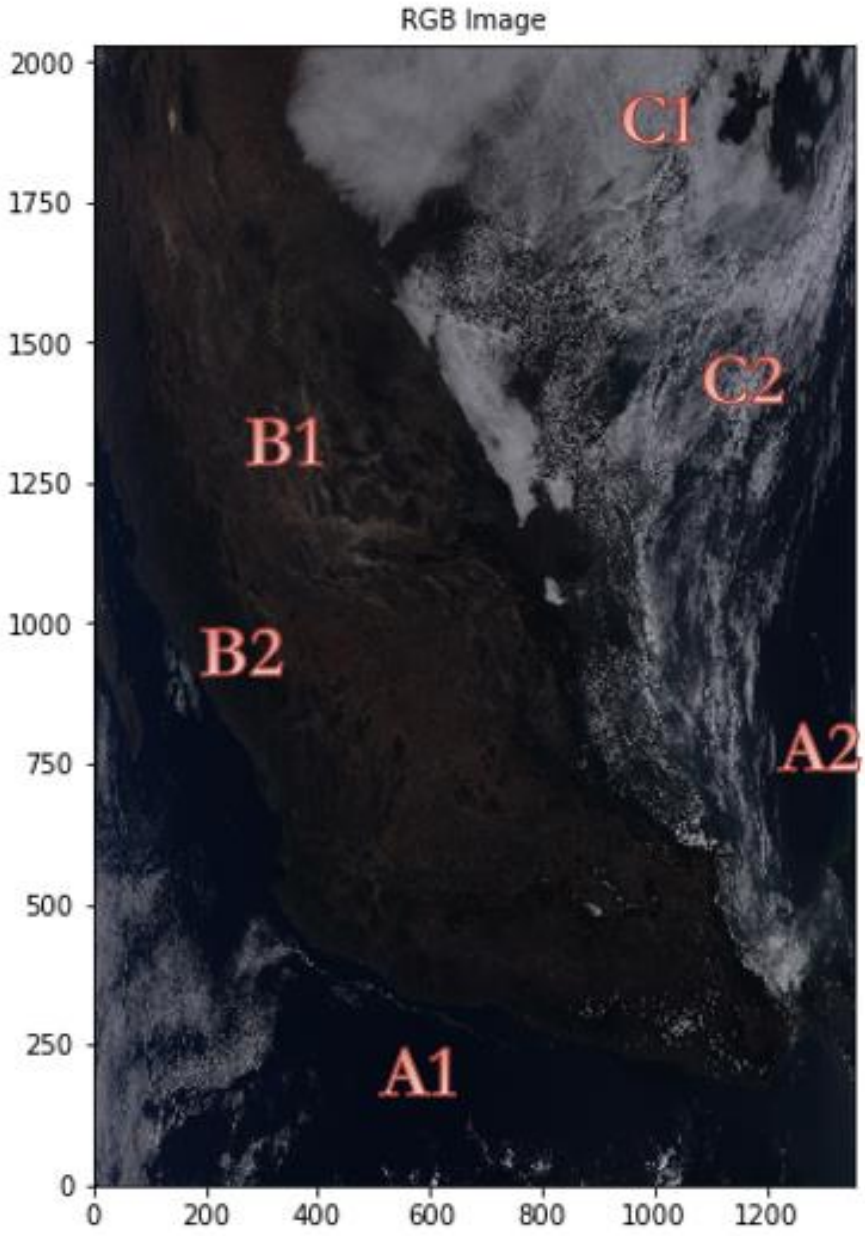


Figure3: **RGB plot** of the downloaded file showing land, ocean, cloud, and vegetation

A1/A2: cloud free atmosphere over ocean

B1/B2: cloud free atmosphere over land showing vegetation and soil

C1/C2: cloudy region over ocean with different cloud types

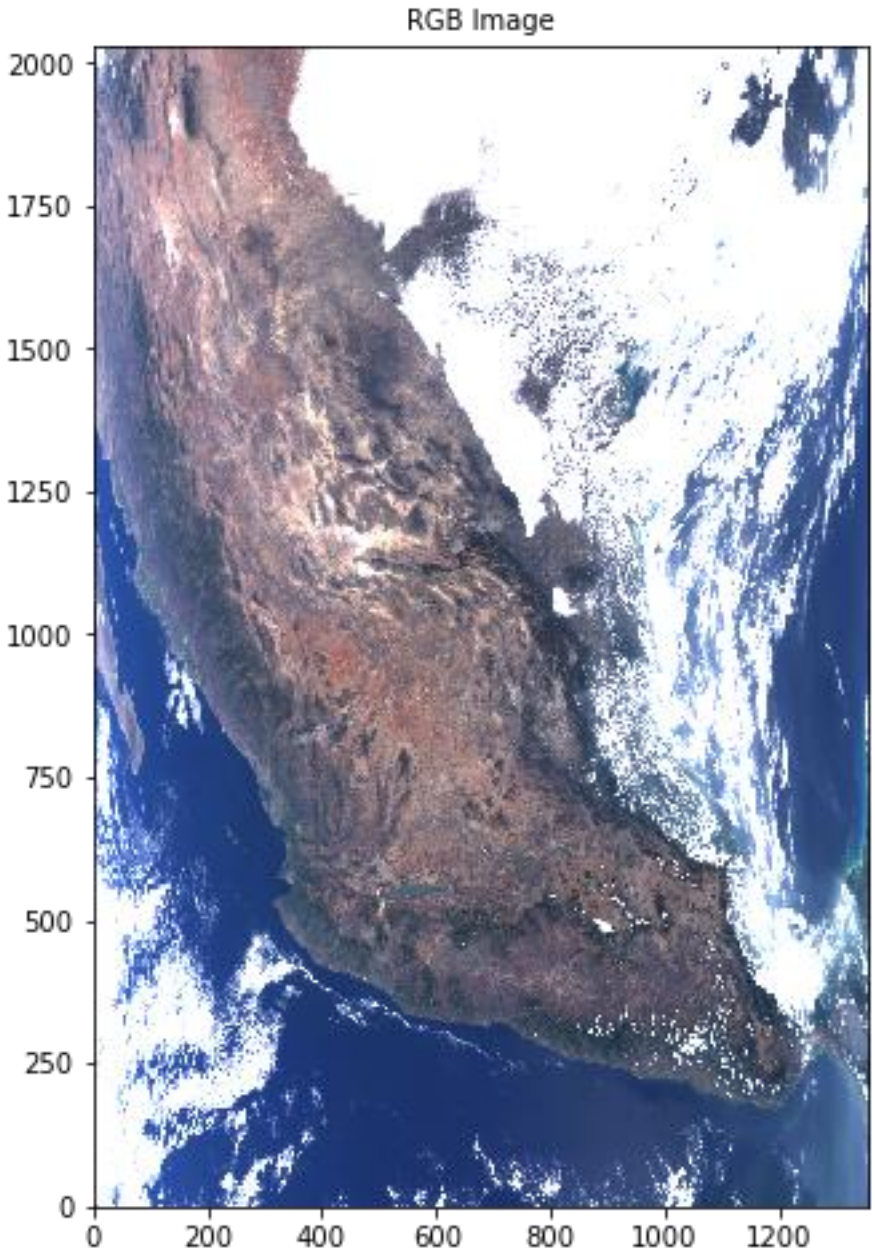
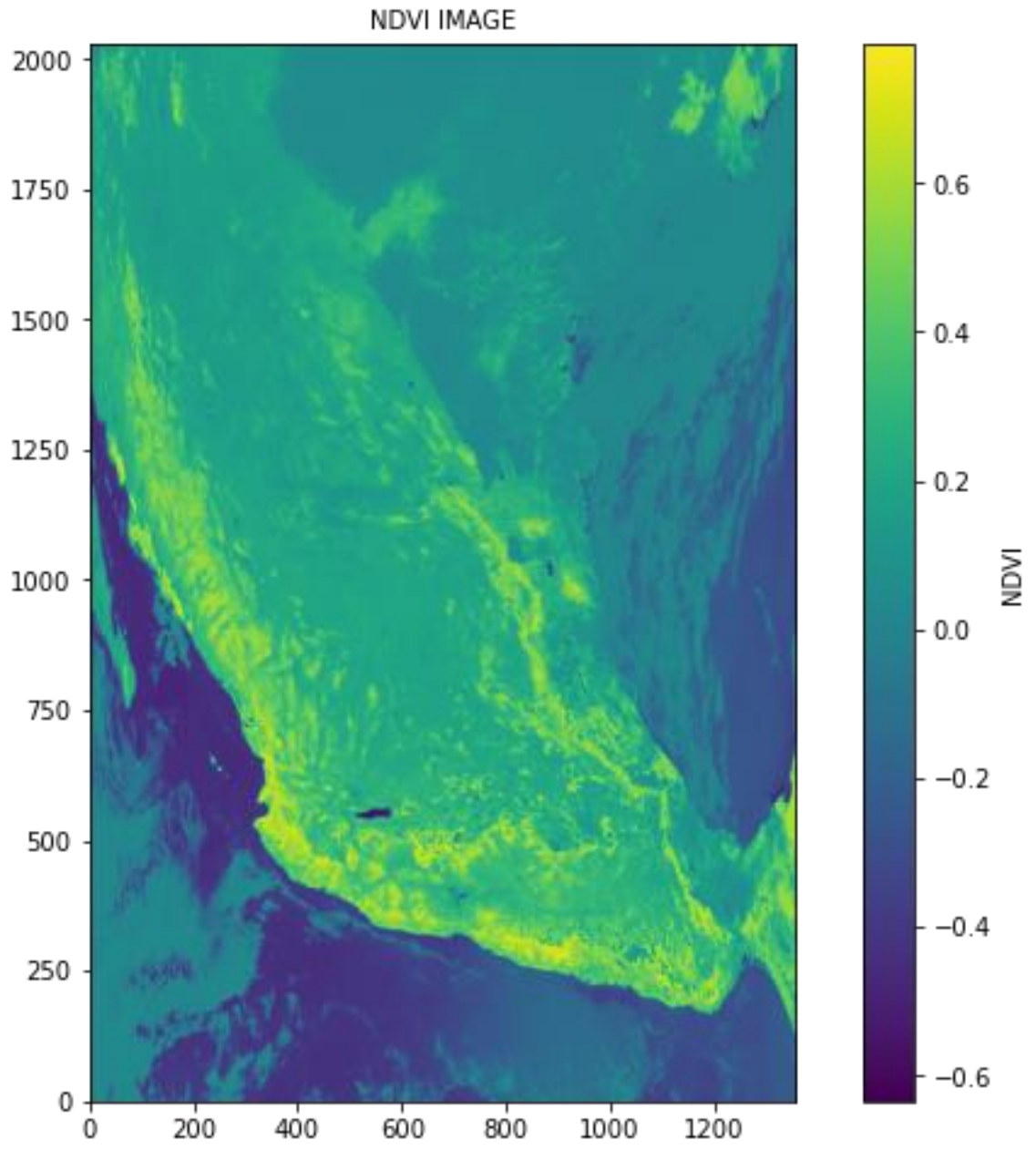


Figure4: RGB plot (**brightness factor of 0.2**) of the downloaded file showing land, ocean, cloud, and vegetation



The high vegetation around the boundary of the land surface is evident with the NDVI plot.

Figure5: **NDVI plot** of the downloaded file showing land, ocean, cloud, and vegetation